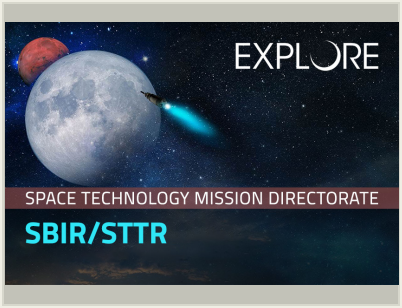
Centrifugal Sieve for Size-Segregation/ Beneficiation of Regolith, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Utilizing centrifugal force as the primary body-force, combined with both shearing flow and vibratory motion the proposed centrifugal-sieve separators can provide efficient gravity-level-independent size classification of granular feedstock like lunar regolith. Standard size separation methods for dry materials often depend on gravity as the primary body force. For separation of small sizes, gravity-force is usually supplemented with vibration and shearing flow. Granular materials naturally stratify during shear-flow with larger particles rising to the top. Depending on frequency and intensity, vibrations alone can induce large particles to rise to the top in a granular bed, independent of shear flow. The proposed centrifugal size-separators utilize the natural size stratification of flowing granular solids. They will function equally well under reduced gravity conditions and in vacuum. The nominal design is a configuration with only one moving part and no blades, or other high-wear components. Shearing flow and vibrations combined with a size-separating screen at the outside (or 'bottom') of the flow will separate particles, with the fines passing through the outer wall screen, and the coarse material passing axially through the continuous feed system. Multiple size separation streams are possible. Alternate designs with shear-enhancing blades, 'above' or inside the screen, will also be evaluated. Various approaches for screen deblinding, and other robustness enhancements, are part of the proposed designs. With appropriate selection of passing-screen size, and deblinding enhancements, the centrifugal-sieves could be used for regolith processor feedstock conditioning to remove material > 0.5cm diameter, and with alternate settings and screen size, also used for a degree of beneficiation, to select particular size ranges that have the highest percentage of desired mineral content. The centrifugal-sieve concept can be scaled to any desired mass flow rate.



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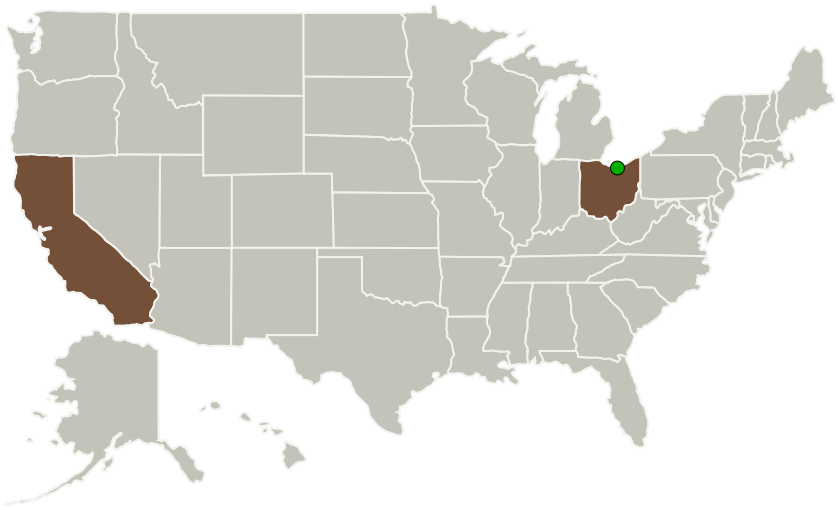
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Grainflow Dynamics, Inc.	Lead Organization	Industry	Livermore, California
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138031)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Grainflow Dynamics, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

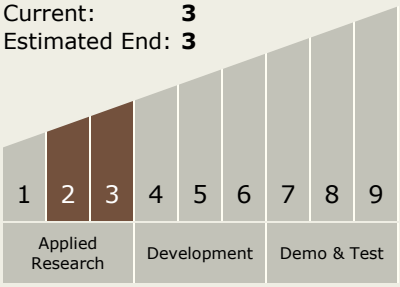
Carlos Torrez

Principal Investigator:

Otis R Walton

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.1 In-Situ Resource Utilization
    - TX07.1.2 Resource Acquisition, Isolation, and Preparation

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System